Developing Monitoring Strategies for Land Managers and the Public at Large

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Biological control process

- Background –host testing etc
- Regulatory authorization
- Local actions
- Convey results

Scope

- Microbial control of plant pathogens
- Microbial control of arthropods
- Microbial control of weeds

- “Establish a partnership with a trusted messenger”
  - Keith Warner

Augmentative

- Commercial
- Public or private lands
- Controlled setting

Classical

- Not commercial
- Public or private lands
- not controlled
- Product may/may not move quickly and far

Examples

Use of a Plant Pathogen as a Classical Weed Biological Control

Yellow Starthistle Rust

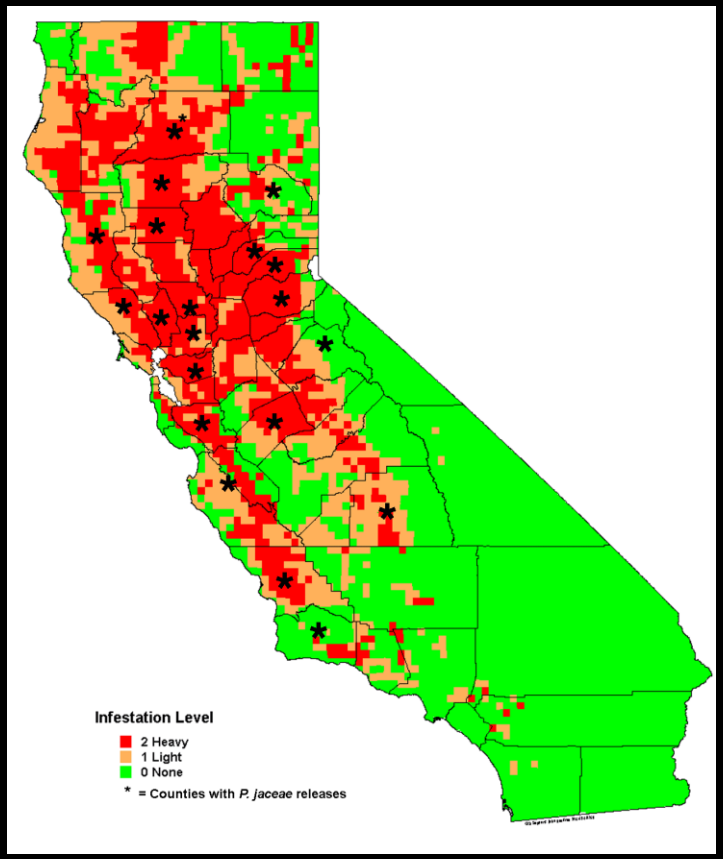
Puccinia jaceae var. *solstitialis*

Yellow starthistle
Centaurea solstitialis

- 6 Million hectares
- Old agents – insects
- Rust
- New agents *or* *not*

Strategy for release plus monitoring

Theoretical Strategy for Release

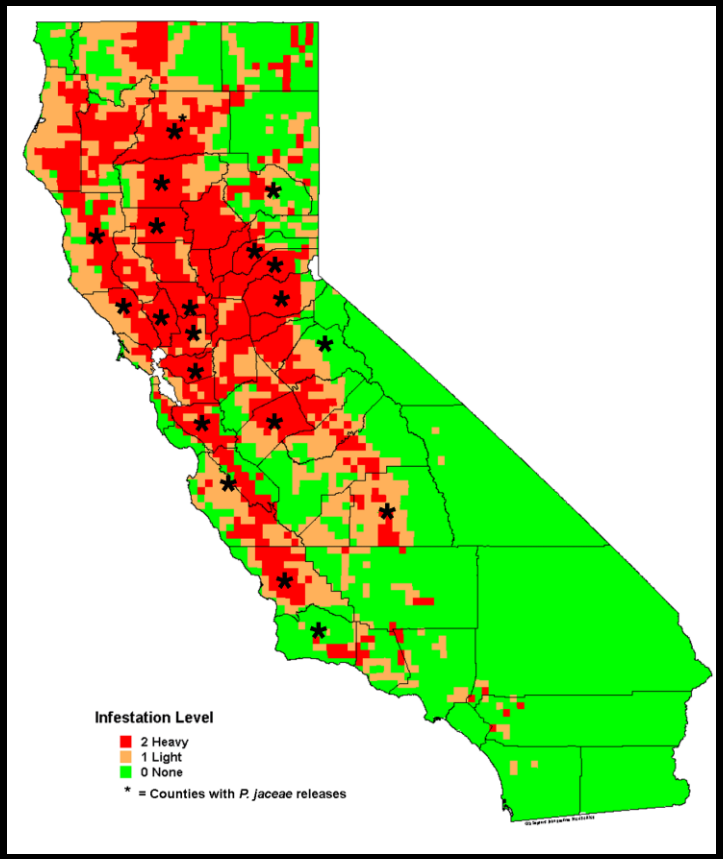


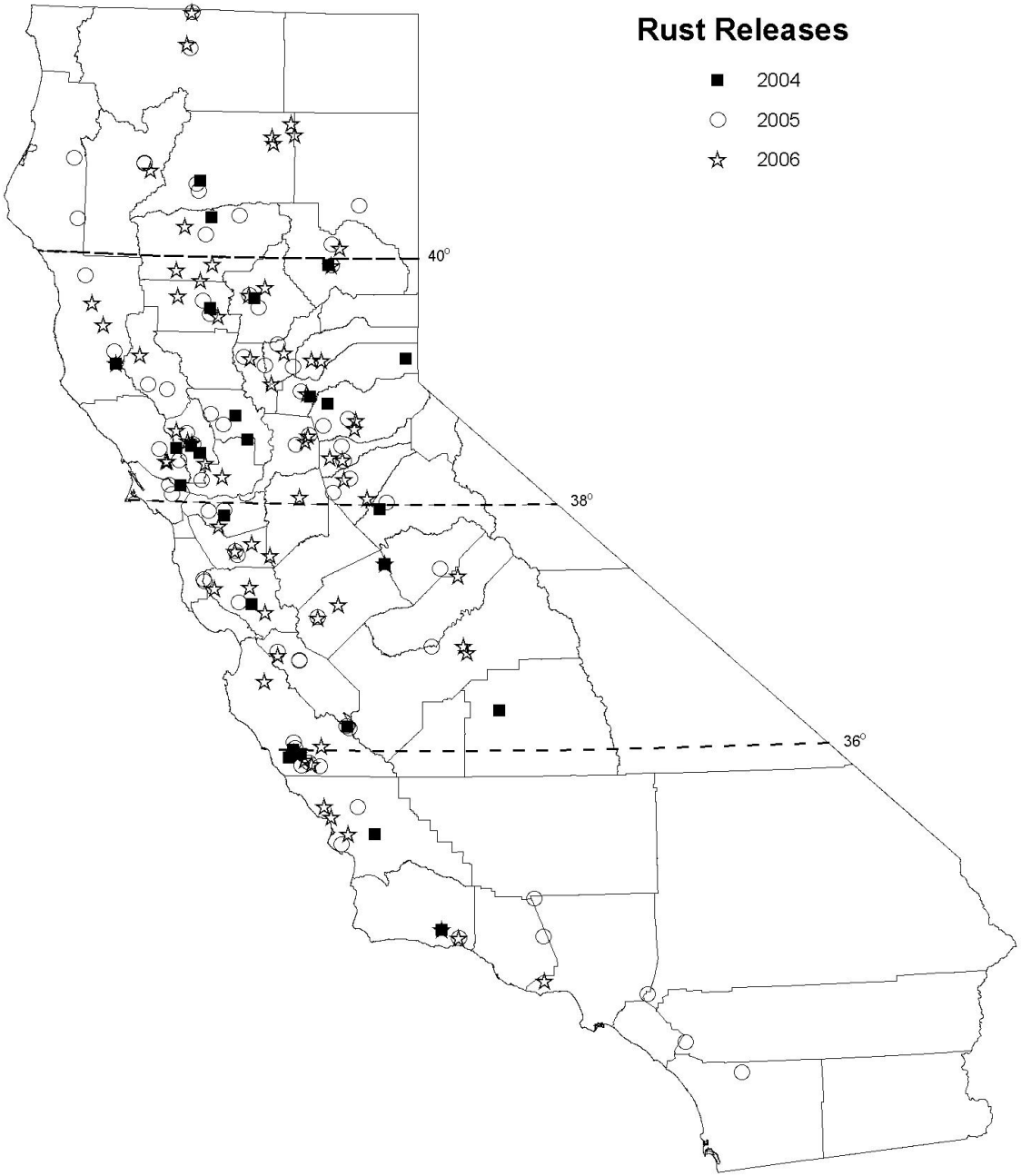
Practical Strategy for Release

- 25 years for approval
  - Pent up anticipation
  - Additional permit conditions
- Approval in late June
  - Fast
  - Close
  - Controlled

Practical Strategy for release

Strategy for release – 2nd year

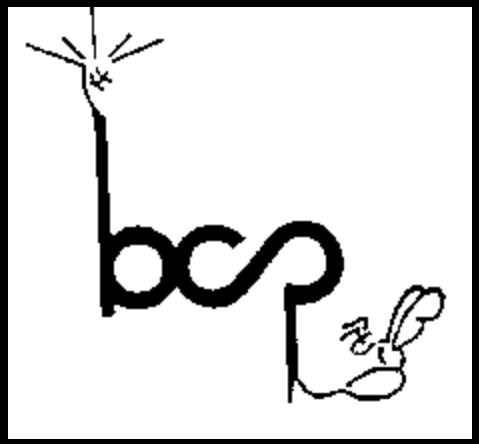




Three years of releases

Incorporating release and monitoring

Administrative structure in CA



- Agricultural commisioners
  - Office per county
  - Large staff
  - Mandated cooperation
  - No fee
  - Public service
- Cooperative extension
- other

Seedhead Flies Currently Used for Biological Control of Yellow Starthistle

Urophora sirunaseva
YST gall fly
introduced 1984

Chaetorellia australis
Peacock fly
introduced 1988

Chaetorellia succinea
False Peacock fly
introduced 1991

Weevils Currently Used for Biological Control of Yellow Starthistle

Bangasternus orientalis
YST Bud Weevil
introduced 1985

Eustenopus villosus
Hairy Weevil
introduced 1990

Larinis curtus
YST Flower Weevil
introduced 1991

Workshops

- Classroom training
- Field site visit
- Paperwork and kit

CDFA Implementation Workshops

CDFA's Biological Control Program performs workshops to train county biologists regarding biology and damage cause by the biological control agents

CDFA Implementation Workshops

Open to County, State, University, and Federal personnel

Consist of active participation of attendees in the collection and release of the biological control agents

Greenhouse production of rust


Milwaukee
HEAVY DUTY
VACUUM

Inoculation kit

Drinking Water
AQUAFI
Purity

Monitoring request

- Visits
- Data collection
- Reporting
- Communication with landowner

Requested visits

- Overnight – remove tent
- 2 weeks – look for pustules within meter
- Every 1-2 weeks – look until find pustules
- 2 weeks after pustules, look outside
- Every 2 weeks until dried out
- Repeat 1-3 years
- Non-target attacks

2003-2006

- 176 releases
- 41 counties

- 2007 survey
- 1-4 year old sites
- 11 not checked
- 15 destroyed - burned
  mowed, scraped, herbicide

Sites destroyed

- Wildfire from 3 miles away
- River flood
- County road department practicing new equipment
- Herbicide spill
- Failure to remove from treatment list-agency communication
- Mowing for community event
- Homeowner – now recognizes YST

Success in visits person/site owner

- State
- County
- University
- Federal – NRCS
- NGO

- Private

Success in visits (person/site owner)

- State
- University
  - No help
  - Longterm safe
  - Occasional multi-use

Success in visits person/site owner

- Federal – Parks, USFWS, BLM, NRCS
- NGO – regional park trusts etc
  - Paperwork
  - Initially big involvement
  - High expectations
  - Interest wanes

Success in visits person/site owner

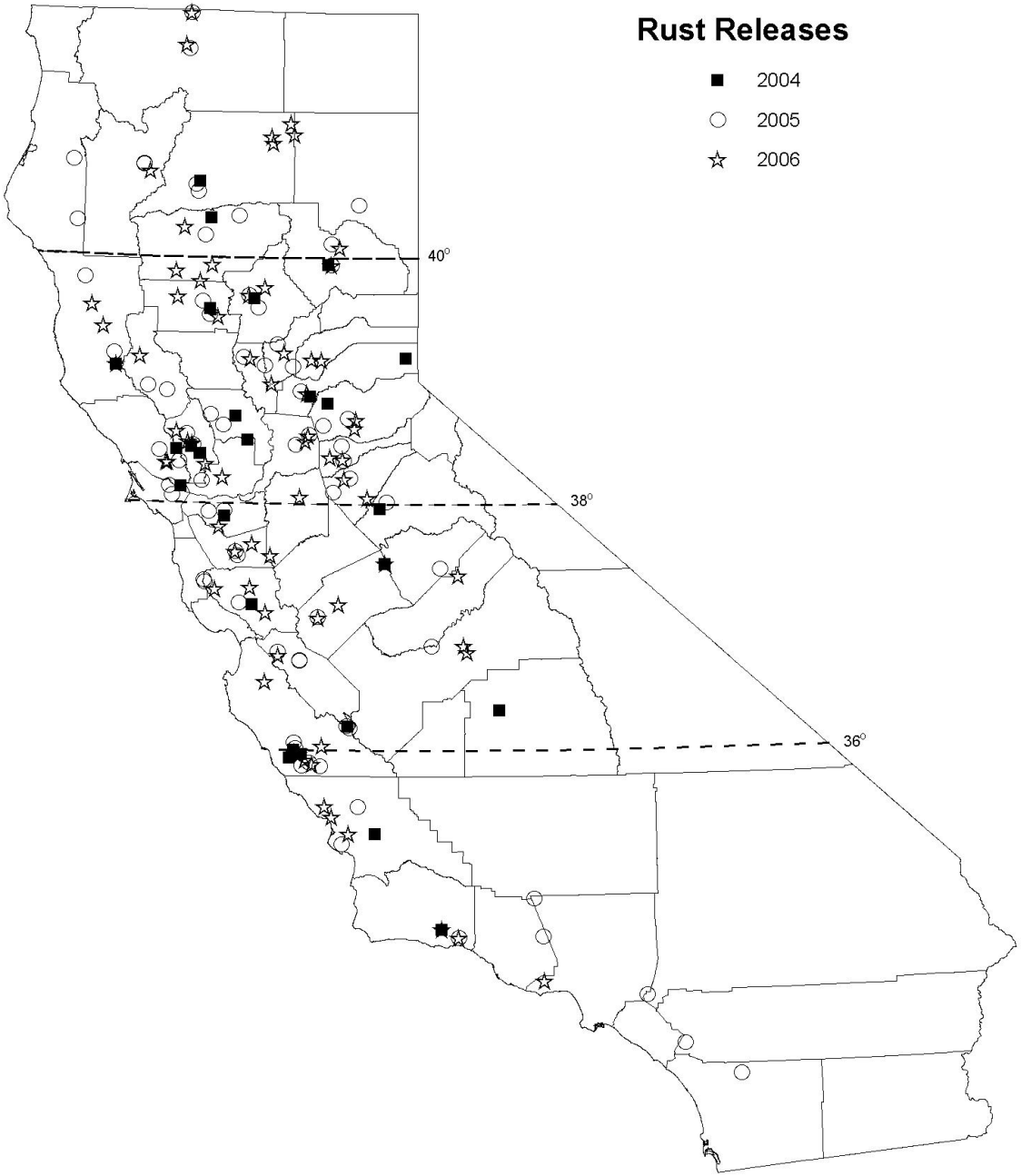
- Private

Success in visits person/site owner

- County
  - Its their job
    - CDFA co-operators
  - Academic/practical balance
    - Interest in science, outdoors, results
  - Contact with landowners
  - Comfortable with paperwork
  - Inconsistent performance

Success

- Enthusiasm
- Don’t oversell
- Dependable
- Don’t inconvience
- Reward
  - In print
  - In public
  - Successful project

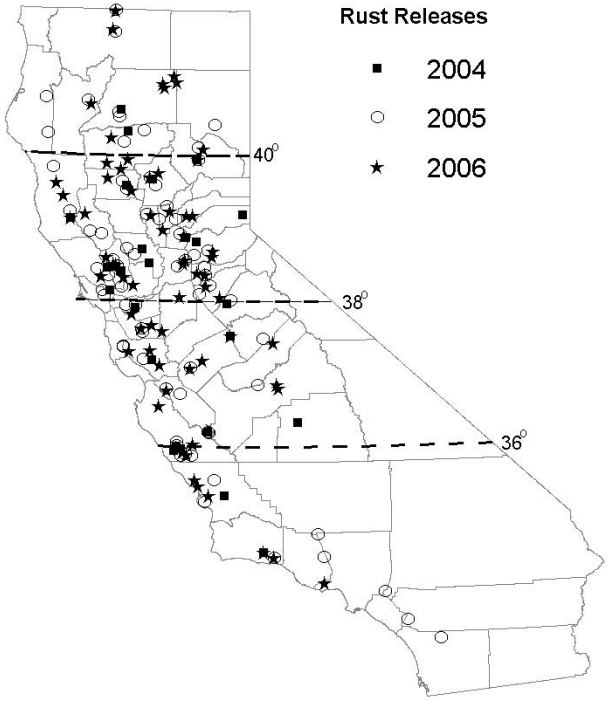


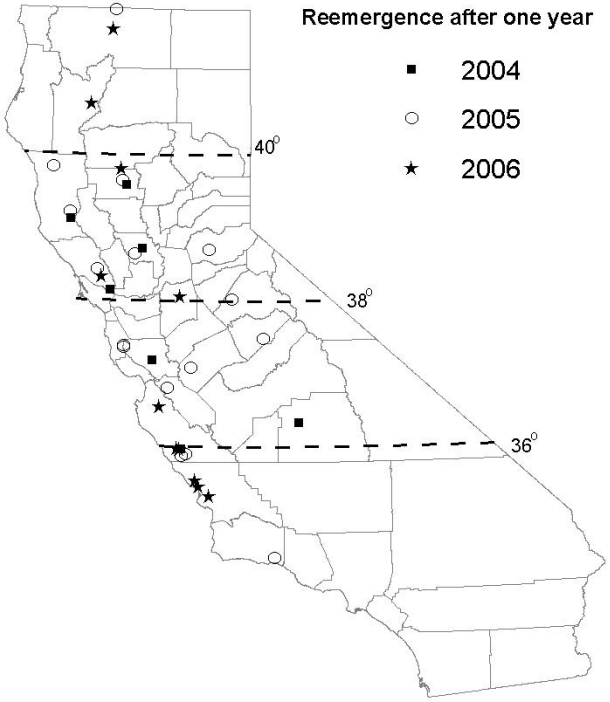
Three years of releases

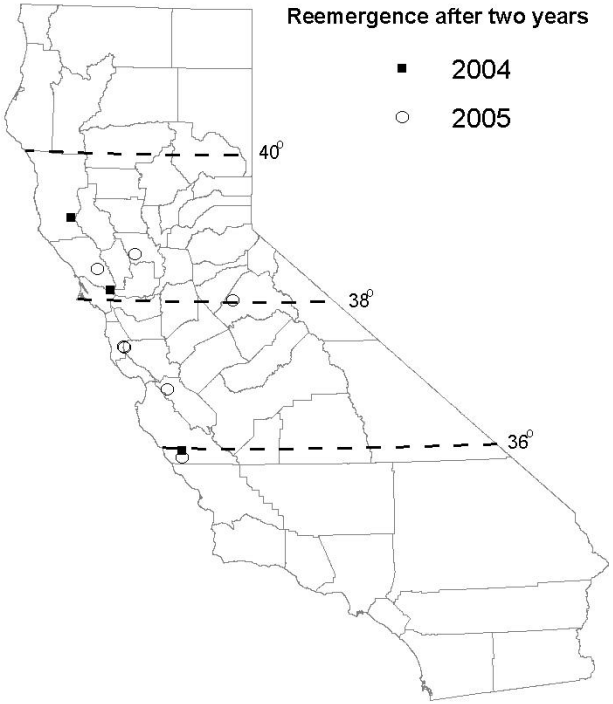
Rust persistence

Release	Present/Reemerged			
	2004	2005	2006	2007
2004	93%	21%	10%	3%
2005		87%	21%	9%
2006			58%	18%

Maps of reemergence







- Inoculates easily
- Spread inconsistent
- Persistence inconsistent
- Shortened leaf life
- No impact on mature plant
- Interaction with insects ?

Public concerns

- Safety
  - Other plants/crops
  - Family and dogs
  - Legal liability
- Inconvience
  - How long
  - How often
  - Damage to property

California field trials of *Beauveria bassiana*

Fungi collected

from Argentine Ants and

Native Fire Ants

Native Fire Ant with Beauveria bassiana


Beauveria bassiana phialides and conidia

Fire ant sampling and monitoring

Musk Thistle